The Long Arm of Mental Health: Quantifying the Effects of Child Mental Health on Scholastic Achievement

Heide Jackson University of Wisconsin-Madison

Alberto Palloni University of Wisconsin-Madison

Anna Barker University of Wisconsin-Madison

Abstract

Poor physical health in childhood has enduring implications for adult labor market performance, yet less is known about how mental health affects long term outcomes. Using data from the National Longitudinal Survey of Youth-Children 1979, we estimate a series of non-recursive regressions and employ simulations to compute the relative and absolute effects of mental and physical health on cognitive and non-cognitive traits, high school attainment, and college attendance. Preliminary findings suggest physical and mental health jointly affect scholastic achievement, and effects of mental health are larger than those of physical health. In future analyses, we compare findings using other data sets, the National Child Development Study 1958 and the British Cohort Study 1970, to check the generalizability and robustness of our conclusions. Initial findings suggest ignoring early mental well-being may dramatically underestimate the effects of early conditions on scholastic achievement and are predictive of future labor market success.

Introduction

There is a well established link between early childhood health and adult economic conditions (Case and Paxson, 2010, Palloni, 2006, Hayward and Gorman, 2004, Heckman, 2007). Existing literature shows that a child's physical health affects later scholastic achievement, yet less is known about whether mental health affects scholastic achievement and the pathways through which mental health may affect adult outcomes. The dearth of research is particularly startling as 29% of adolescents have some mental disorder and mental health conditions developed in adolescence are strongly predictive of adult mental health (Murphey et al., 2013). There are some exceptions to wit: studies by Delaney and Smith (2012) and Goodman and colleagues (2011) find significant effects of mental health early in life on adult educational attainment and socioeconomic status in the United States and Great Britain . However neither of these studies explores the pathways through which mental health affects educational attainment . By omitting measures of mental health, current estimates of early health's effects on scholastic achievement may be biased as estimated effects of physical health may be attenuated or compounded by a child's mental health status. In this study, we seek to address this gap in the literature by assessing the long term effects of early physical and mental health on cognitive and non cognitive traits, high school graduation, and college attendance. Using data from the National Longitudinal Survey of Youth-Children 1979 (NLSY-C 1979), a cohort of US youth followed from birth to adulthood, we employ a regression and simulation strategy to:

1. Estimate the cumulative effect of mental and physical health on educational attainment.
2. Determine the mechanisms through which mental health impacts later outcomes.
3. Demonstrate how effects of early childhood health would change if mental health did not affect later achievement.

Our preliminary analysis suggests that mental health is important for future achievement, that mental health affects cognitive and non-cognitive development, and that models which exclude measures of mental health significantly underestimate the effect of childhood health on later scholastic achievement.

Data and Variables

To study these research questions, we rely primarily on data from the National Longitudinal Survey of Youth-Children 1979 (NLSY-C 1979). Beginning in 1986, the NLSY-C 1979 surveyed children born to the female members of the NLSY 1979, a nationally representative sample of youth who were between the ages of 14 and 22 in 1979. Biennially, children and their mothers have been interviewed on topics related to the child's physical and emotional health, cognitive and non-cognitive development, educational attainment, and more general questions about the household's socioeconomic status and structure.

Independent Variables:

Our primary independent variables are measures of a child's physical and mental health at ages 6 and 12. Physical health at ages 6 and 12 is measured as whether a child has: a chronic respiratory condition, severe allergies or asthma, a hearing, speech, or vision impediment or a physical condition that limits mobility.[1] Mental health at these ages is measured as whether a child has ever been recommended to or received counseling for any psychological or emotional problem. One concern in conducting this analysis is that mental health disorders may be stigmatized and under-reported. However, we have addressed this by varying our mental health measures in a sensitivity analysis.

Dependent Variables:

Our ultimate outcome is a child's educational attainment measured as whether the child dropped out of high school, obtained a GED, graduated from high school, or went on to attend college.

However, as many of the effects of physical and mental heath on educational attainment may be indirect, we treat child non-cognitive and cognitive traits at ages 6 and 12 as mediators through which health may affect scholastic achievement. At both ages, non-cognitive scores are measured as a child's standardized score on the behavior problems index, an overall measure of a child's suitability to the school and home environment. Cognition is measured as a standardized average score on the Peabody Individual Achievement Tests in math, reading recognition and reading comprehension.

Controls:

As child circumstances at birth have proven important predictors of all outcomes in this study, we include a measure of whether a child was born at a low birth weight (below 5.5 lbs). Additionally, we control for the child's race (African American, Hispanic, Other), the child's gender (male/female), the child's household's poverty status at the time of the child's birth (above or at/below the federal poverty line) and the child's mother's education (less than high school, high school, some

[1] We attempt to use estimates from when the child was exact age 6 and exact age 12 but as measures for exact ages are not available we take estimates from the two year surrounding ages if exact age measures are not available. I.E. if a measure at age 6 is not available we use a measure from age 5, if age 5 is not available we use age 7.

college, a 4 year college degree, more than a 4 year college degree). We induce these measures in our analyses to account for potential confounding factors that may predict both a child's health and the child's educational attainment. Finally in a sensitivity analysis, we will control for measures of a mother's mental health, her score on the CES-D depression index. We do not control for this in the main analysis because we do not have measures of a mother's mental health at relevant ages for a substantial proportion of the sample.

Methods

To assess the effects of mental health on scholastic achievement, we perform two tasks. First we construct a series of non-recursive regression models to estimate effects of physical and mental health on scholastic achievement through cognitive and non-cognitive pathways as shown in Figure 1. We then use these regression estimates as the basis for simulations to quantify the cumulative effects of mental and physical health on educational attainment as well as to illuminate the pathways through which health affects educational attainment.

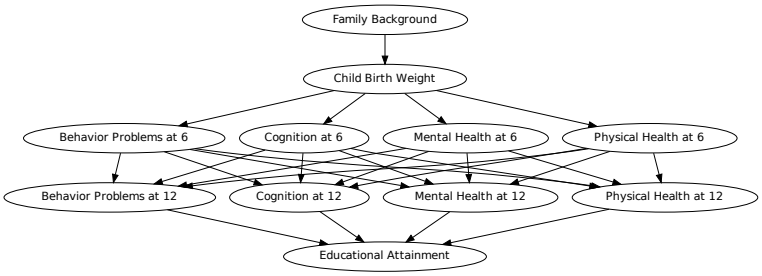

Figure 1: Pathways Health Affects Educational Attainment

Part 1. Regression Estimation

As shown in Figure 1, we use data from NLSY-C 1979 to estimate a series of non-recursive regression models representing the expected relations between early child physical and mental health, cognitive, non-cognitive, and health outcomes around age 12 and the expected probability that the child will drop out of high school, obtain a GED, graduate from high school, and enter college. Using a non-recursive regression strategy, we seek to minimize problems of reverse causality.

Our models are additionally designed to minimize biases caused by missing information and selective attrition from the sample. We handle these problems by running models with imputed data, where case information is imputed conditional on the case not permanently leaving the survey and cases are weighted based on their probability of attriting from the sample.

Part 2. Simulation Analysis

A unique feature of the procedures we propose is that via simulation of counterfactuals we are able to convert estimates from these conventional regression models into expected changes of selected outcomes as a function of changes in early conditions. The simulations are to simulate an initial sample with the baseline characteristics of the NLSY-C, then use regression coefficients to predict a child's outcomes at birth, age 6, age 12, and as a young adult. In the simulations, we substitute a child's observed characteristics at these ages with those predicted by the regressions under four simulated scenarios:

1. A base case where no parameters are systematically changed.
2. A scenario where we assume mental health does not affect scholastic achievement through direct nor indirect pathways.
3. A scenario where we assume physical health does not affect scholastic achievement through direct nor indirect pathways.
4. A scenario where we assume both physical and mental health do not affect scholastic achievement through direct nor indirect pathways.

To increase the robustness of our findings, we repeat the regression exercise 500 times in order to generate a distribution of outcomes under these scenarios. We are thus able to estimate with some precision the relative importance of physical and mental health for scholastic achievement and the pathways through which physical and mental health matter.

Results

Table 1 shows preliminary estimates of the effects of mental and physical health at age 6 on the expected health, cognition, and non-cognitive skills at age 12 as well as the effect of mental and physical health at ages 6 and 12 on the likelihood that a youth will graduate from high school. These effects are from regressions run on imputed data that control for other confounding factors as described in **Data and Variables**.

	(1) Counseling 12	(2) Behavior Problems 12	(3) Cognition 12	(4) Physical Health 12	(5) High School Equivalence
Counseling 6	0.990***	0.132**	-0.152*	0.540**	0.120
	(8.00)	(2.70)	(-2.25)	(2.71)	(0.42)
Behavior Problems 6	0.419***	0.425***	-0.0751***	0.190**	0.0243
	(8.35)	(36.71)	(-7.34)	(2.77)	(0.37)
Cognition 6	-0.0972	-0.0236	0.279***	-0.0563	-0.0482
	(-1.71)	(-1.70)	(21.08)	(-1.20)	(-0.64)
Physical Health 6	0.220	0.0183	-0.121*	1.342***	-0.119
	(1.68)	(0.50)	(-2.21)	(10.97)	(-0.63)
Counseling 12					-0.295
					(-1.19)
Behavior Problems 12					-0.00120
					(-0.02)
Cognition 12					0.452***
					(5.00)
Physical Health 12					0.0113
					(0.05)
N	8442	8442	8442	8442	6158

t statistics in parentheses
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1: Estimates of the Effects of Physical and Mental Health

The results show that the need for mental health counseling services at age 6 increases the likelihood of future counseling, decreases a child's cognition scores at 12, increases a child's behavior problems, and increases the child's risk for having a physical health problem at age 12. Physical health limitations at age 6 are linked to a higher risk of health limitations at age 12 and lower cognition scores. These effects of physical and mental health on cognition are important because cognition scores are the single greatest predictor of high school graduation. We quantify the cumulative effects of physical and mental health in simulations as described in **Methods**. Results from these simulations are shown in Figure 1 and confirm that the proportion of the population expected to attain a high school equivalence would substantially increase if childhood physical and mental health problems were eliminated and that the effects of mental health are slightly larger than those of physical health.

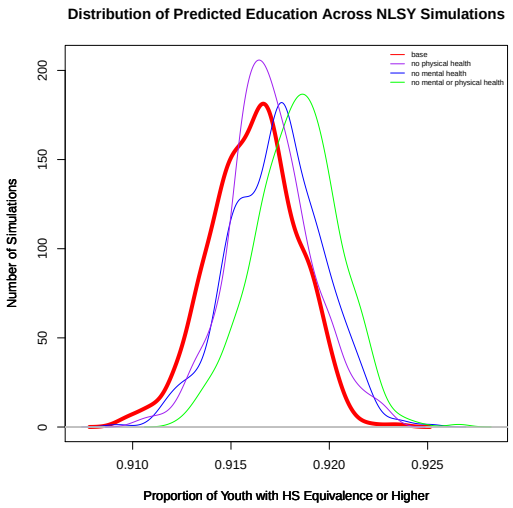

Figure 2: Simulation Results

Sensitivity Checks

We will perform a number of alternative analyses to check the robustness of our findings. First, we plan to vary the measures of mental and physical health to determine how sensitive our conclusions are how health is operationalized. Second, we will address concerns about potentially omitted variables by conducting a sibling analysis. This strategy allows us to control for potentially unobserved household factors in order to study how differences in sibling health affect their later scholastic outcomes.

Finally, while we focus on the NLSY-C 1979, we will also compare results to other nationally representative studies with comparable measures available. Specifically, we will use data from the Early Childhood Longitudinal Surveys-Kindergarten 1998-1999 to get another estimate of the effects of early mental health on cognitive and non-cognitive skills in the United States, To estimate the effects of early mental health on both cognitive and non-cognitive skills and educational attainment in Great Britain, we will use data from the National Childhood Development Study 1958 and British Cohort Study of 1970. In all data sets, we will repeat the regression and simulation exercises as described in **Methods.** Whenever possible, we will construct measures comparable to those available in the NLSY-C 1979. As the education system in Great Britain differs from that of the United States, we will use passing any A level exam as an approximate equivalent to obtaining a high school diploma, following work done by Banks and colleagues (2006.Comparing results using different data sets will allow us to assess the robustness of our conclusions about the effects of mental health and their generalizability across time periods and countries.

Implications

Our findings show that both physical and mental health in childhood are strong predictors of scholastic achievement. Mental health effects operate primarily through increasing a child's later behavioral problems and reducing cognition scores. These results suggest that by only accounting for a child's physical health, current literature may underestimate the effects of early childhood conditions on later educational attainment. We also know with certainty that high school graduation and college attendance are strong determinants of labor market performance, wages and incomes, and as such these early markers of mental and physical health may have enduring consequences for adult socioeconomic success.

Bibliography

Anne Case and Christina Paxson. Causes and Consequences of Early-Life Health. *Demography*, 47:66–88, 2010.

Liam Delaney and James P Smith. Childhood Health: Trends and Consequences over the Life-course. *The Future of children/Center for the Future of Children, the David and Lucile Packard Foundation*, 22(1):43, 2012.

Alissa Goodman, Robert Joyce, and James P Smith. The long shadow cast by childhood physical and mental problems on adult life. *Proceedings of the National Academy of Sciences*, 108(15):6032–6037, 2011.

Mark D Hayward and Bridget K Gorman. The long arm of childhood: The influence of early-life social conditions on men's mortality. *Demography*, 41(1):87–107, 2004.

James J Heckman. The economics, technology, and neuroscience of human capability formation. *Proceedings of the national Academy of Sciences*, 104(33):13250–13255, 2007.

Michael Marmot Zoe Oldfield James Banks and James P. Smith. Disease and Disadvantage in the United States and in England. *JAMA*, 295(17):2037–2045, 2006. Also uses HRS Health and Retirement Survey and England Longitudinal Survey of Aging like Avendano et. al.

David Murphey, Megan Barry, and Brigitte Vaughn. Mental Health Disorders. Adolescent Health Highlight. Publication# 2013-1. *Child Trends*, 2013.

Alberto Palloni. Reproducing Inequalities: Luck, Wallets, and the Enduring Effects of Childhood Health. *Demography*, 43 (4):587–615, 2006.